

WHAT IS CLAIMED IS:

1. A wavelength selecting module for selecting a light signal having a specific wavelength from a plurality of light signals having different center wavelengths, the plurality of light signals being provided as diverging light, the module comprising:

a first collimator for collimating the diverging light to generate a collimated light beam; and

10 a liquid crystal cell having a predetermined helical direction, wherein the liquid crystal cell separates a light signal having a specific wavelength among the plurality of light signals of the collimated light beam into a left circularly polarized light and a right circularly polarized 15 light, reflects one of the left and right circularly polarized light signals that has a same optical rotatory direction as the predetermined helical direction toward the first collimator in a first state, and passes the plurality of light signals of the collimated light beam in a second 20 state, and wherein the liquid crystal cell changes between the first state and the second state in accordance with a change in physical energy applied thereto.

2. The wavelength selecting module according to claim 25 1, wherein the liquid crystal cell includes:

a liquid crystal having a pair of surfaces; and  
a pair transparent electrodes which are provided on the pair of surfaces and to which a voltage as the physical energy is applied.

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3. The wavelength selecting module according to claim 1, wherein the liquid crystal is one of a cholesteric liquid crystal and a chiral nematic liquid crystal.

4. The wavelength selecting module according to claim 1, wherein the collimator includes:

5 a collimator lens for collimating the diverging light to generate the collimated light beam and converging an optically selected light signal having the specific wavelength reflected by the liquid crystal cell;

10 a first optical fiber for guiding the plurality of light signals to emit the diverging light to the collimator lens; and

a second optical fiber for transmitting the optically selected light signal.

15 5. The wavelength selecting module according to claim 1, further comprising a second collimator for receiving a transmission light beam which pass the liquid crystal cell and conversing the transmission light beam.

20 6. The wavelength selecting module according to claim 5, wherein the second collimator includes:

a collimator for conversing the transmission light beam; and

an optical fiber for transmitting the transmission light beam.

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7. The wavelength selecting module according to claim 1, wherein the first collimator includes a first collimator unit for causing the collimated light beam to obliquely enter the liquid crystal cell; and

30 a second collimator unit for conversing an optically selected light signal having a specific wavelength reflected by the liquid crystal cell.

8. The wavelength selecting module according to claim 5, further comprising a second collimator for converting a transmission light beam obliquely emitted from the liquid crystal cell.

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9. The wavelength selecting module according to claim 1, further comprising a first wave plate, located between the liquid crystal cell and the first collimator, for converting the plurality of light signals of the collimated light beam 10 to a plurality of circularly polarized light signals having a same optical rotatory direction as the predetermined helical direction of the liquid crystal.

10. The wavelength selecting module according to claim 15 9, further comprising a second wave plate, arranged opposite to where the first wave plate is provided and facing the liquid crystal cell, for returning the plurality of circularly polarized light signals which have passed the liquid crystal cell to a plurality of non-polarized light 20 signals.

11. A wavelength selecting apparatus for selecting at least one light signal from a plurality of light signals having different center wavelengths the plurality of light 25 signals being provided as diverging light, the apparatus comprising:

a plurality of wavelength selecting modules; and  
a plurality of optical fibers for optically connecting the plurality of wavelength selecting modules, wherein each 30 wavelength selecting module includes,

a first collimator for collimating the diverging light to generate a collimated light beam, and  
a liquid crystal cell having a predetermined

helical direction and receiving the plurality of light signals of the collimated light beam from the first collimator, wherein the liquid crystal cell separates a light signal having an associated wavelength among the plurality of 5 light signals of the collimated light beam into a left circularly polarized light and a right circularly polarized light, reflects one of the left and right circularly polarized light signals that has a same optical rotatory direction as the predetermined helical direction toward the 10 first collimator in a first state, passes the plurality of light signals of the collimated light beam in a second state, and wherein the liquid crystal cell changes between the first state and the second state in accordance with a change in physical energy applied thereto.

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12. The wavelength selecting apparatus according to claim 11, wherein at least one liquid crystal cell enters the first state by individually changing voltages as physical energy supplied to the liquid crystal cells of the wavelength 20 selecting modules.

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13. The wavelength selecting apparatus according to claim 11, wherein each wavelength selecting module further includes:

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a first wave plate, located between the liquid crystal cell and the first collimator, for converting the plurality of light signals of the collimated light beam to a plurality of circularly polarized light signals having a same optical rotatory direction as the predetermined helical direction of the liquid crystal; and

a second wave plate, arranged opposite to where the first wave plate is provided and facing the liquid crystal cell, for returning the plurality of circularly polarized

light signals which have passed the liquid crystal cell to a plurality of non-polarized light signals.

14. A wavelength selecting apparatus for selecting at  
5 least one light signal from a plurality of light signals  
having different center wavelengths, the plurality of light  
signals being provided as diverging light, the apparatus  
comprising:

a first collimator for collimating the diverging light  
10 to generate a collimated light beam; and

a liquid crystal cell unit for receiving the plurality  
of light signals of the collimated light beam from the first  
collimator and reflecting at least one light signal toward  
the first collimator, wherein the liquid crystal cell unit  
15 includes a plurality of stacked liquid crystal cells and  
wherein each liquid crystal cell includes,

a liquid crystal which has a pair of surfaces and  
a predetermined helical direction, wherein the liquid crystal  
separates a light signal having an associated wavelength  
20 among the plurality of light signals of the collimated light  
beam into a left circularly polarized light and a right  
circularly polarized light, reflects one of the left and  
right circularly polarized light signals that has a same  
optical rotatory direction as the predetermined helical  
25 direction toward the first collimator in a first state,  
passes the plurality of light signals of the collimated light  
beam in a second state, and wherein the liquid crystal  
changes between the first state and the second state in  
accordance with a change of a voltage applied thereto, and

30 a pair of transparent electrodes which is provided  
on the pair of surfaces of the liquid crystal and to which  
the voltage is applied, wherein at least one liquid crystal  
enters the first state by individually changing voltages

applied to the liquid crystals via the pairs of transparent electrodes.

15. The wavelength selecting apparatus according to  
5 claim 14, further comprising:

a first wave plate, located between the liquid crystal cell unit and the first collimator, for converting the plurality of light signals of the diverging light beam to a plurality of circularly polarized light signals having a same 10 optical rotatory direction as the predetermined helical direction of the liquid crystal; and

a second wave plate, arranged opposite to where the first wave plate is provided and facing the liquid crystal cell, for returning the plurality of circularly polarized 15 light signals which have passed the liquid crystal cell to a plurality of non-polarized light signals.

16. The wavelength selecting apparatus according to  
claim 14, wherein the first collimator includes:

20 a collimator lens for collimating the diverging light signal to generate the collimated light beam and conversing an optically selected light signal having a specific wavelength reflected by the liquid crystal cell, and

25 an optical fiber for guiding the plurality of light signals and the optical selection signal; and

the wavelength selecting apparatus further comprises an optical circulator having a first terminal connected to the optical fiber, a second terminal for receiving the diverging light and a third terminal for outputting the optically 30 selected light signal.

17. The wavelength selecting apparatus according to  
claim 14, further comprising a second collimator for

receiving a transmission light beam which pass the liquid crystal cell unit and conversing the transmission light beam.